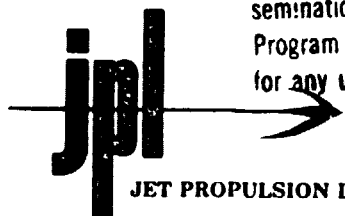


General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.
- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.
- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.
- This document is paginated as submitted by the original source.
- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

ORIGINAL PAGE IS
OF POOR QUALITY



"Made available under NASA sponsorship
in the interest of early and wide dis-
semination of Earth Resources Survey
Program information and without liability
for any use made thereof."

E83-10220 ^{SPT}
CR-170078

JET PROPULSION LABORATORY California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91109

ERA:384-83-ALZ18
9 March 1983

TO: Mr. David Fischel
Code 932
Goddard Space Flight Center

FROM: Dr. Albert L. Zobrist *ALZ*
Image Processing and Applications and Development Section
Jet Propulsion Laboratory

SUBJECT: Quarterly Progress Report Landsat-D Proposal A-25 "Evaluation of
Landsat-4 TM and MSS Ground Segment Geometry Performance Without
Ground Control"

General Status of Work

In order to produce results for the Landsat-D Early Results Symposium at Goddard Space Flight Center in February, newly-developed software and analysis techniques were applied to the Nov. 2, 1982 Washington, D. C. scene. A good characterization of MSS and TM geometry for this scene was obtained, yielding an assessment of the Landsat-D ground segment processing as of November, 1982 and also showing the potential for improvements in that processing. These results were presented in two sessions at the Early Results Symposium and a summary will be published with those proceedings.

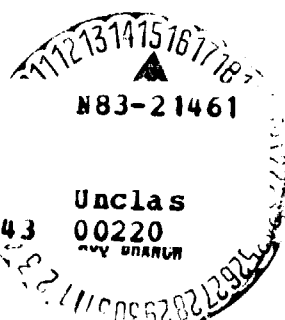
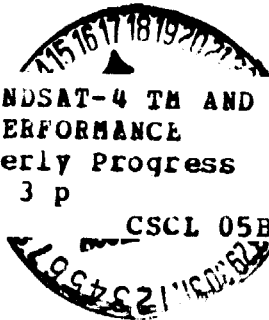
Open Problems:

A second scene acquisition was desired for the experiment to test multi-date registration capabilities. In the light of the present Spacecraft shut-down, dates with good MSS acquisitions have been identified but it is not confirmed that TM was acquired. Locke Stuart of GSFC is investigating.

Solved Problems

We have received one TM Scrounge acquisition for both primary test areas. A Path 39/Row 37 acquisition dated December 12, 1982 and a Path 15/Row 32 acquisition for November 2, 1982. MSS counterparts for both scenes are on order from EDC.

(E83-10220) EVALUATION OF LANDSAT-4 TM AND
MSS GROUND SEGMENT GEOMETRY PERFORMANCE
WITHOUT GROUND CONTROL Quarterly Progress
Report (Jet Propulsion Lab.) 3 p
HC A02/MF A01





-2-

3/9/83

Early Results

1. The along-line one dimensional FFT algorithm has been successfully used to test band-to-band, swath-to-swath, and inter-swath registration.
2. For MSS an analysis of the tabulated and plotted results revealed the following characteristics: a) There is no measurable swath-to-swath misregistration in the P-format imagery. b) Band-to-band registration is 0.1 pixel or less on the average. c) Line-to-line jitter effects may be occurring, but could not be more than one half pixel offset in any instance. d) It is apparent from the line-to-line plots that approximately 1/8 pixel shift to the right predominates. This may be a scene dependent artifact associated with the eleven degree off-polar orbit, an artifact of our phase correlation algorithm, or indicate a need to tune the estimate of spacecraft velocity for the geometric calibration. e) There appears to be a brightness modulation with a pseudo coherent pattern that gives a false impression of swath-to-swath misregistration. The brightness modulation is more severe on the right than left side of the frame, and may be associated with jitter impacting dwell time rates over pixels. f) Ground control point offsets from the residual surface fit are generally good (RMSE of 2.5 pixels or 142.5 meters), although some points are off to a significant degree. An analysis of the TM P-data revealed a slow spacecraft roll condition under one hertz in this scene. As only two gpcs were found by the Landsat-4 ground processing system, this systematic distortion was not adequately removed.
3. For TM an analysis of the tabulated and plotted results revealed the following characteristics: a) Band-to-band registration in the primary focal plane (bands 1-4) is less than 0.1 pixel with the possible exception of band 4, which may be slightly above 0.1 pixel. b) Band-to-band registration between bands in the primary and secondary focal planes varies between minus 0.1 and minus 0.35 pixels on the average where good correlations could be obtained (note the different spectral responses for each band made a comparison difficult sometimes). d) Line-to-line misregistration averages less than 0.1 pixel, with some apparent local misregistration of 0.3 pixel. Plots failed to show any systematic misregistration effects that can be directly associated with local jitter. e) Ground control point offsets from the residual surface fit are generally good (RMSE of 4.43 pixels or 132.77 meters), although some points are off to a significant degree. An analyses of the TM P-data shows that a slow spacecraft roll condition of under one hertz exists in this scene. It is expected that an even distribution of gpcs could effectively remove the roll distortion encountered.

ORIGINAL PAGE IS
OF POOR QUALITY



JET PROPULSION LABORATORY California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91109

-3-

Publications:

1. N. A. Bryant, A. L. Zobrist, F. C. Billingsley, S. Z. Friedman, B. Gokhman, and T. L. Logan, "Evaluation of Landsat-4 Thematic Mapper Ground Segment Performance Without Ground Control", Landsat-4 Early Results Symposium, Goddard Space Flight Center, February 22-24, 1983.
2. N. A. Bryant, A. L. Zobrist, F. C. Billingsley, S. Z. Friedman, B. Gokhman, and T. L. Logan, "Evaluation of Landsat-4 Multispectral Scanner Ground Segment Performance", Landsat-4 Early Results Symposium, Goddard Space Flight Center, February 22-24, 1983.

Data Provided by GSFC:

1. Three sets of imagery acknowledged in previous quarterly report.
2. A and P format TM scene, Harrisburg, Pennsylvania.
3. Seven band TM scene, P format, Salton Sea, California.
4. Seven band TM scene, P format, Miami, Florida.

cc: Locke Stuart, Code 902/GSFC
F. C. Billingsley, 168-527
J. King, 180-703
P. Larsuel, 180-703
N. A. Bryant, 168-514